

THE VAGUS NERVE AND OUR DIGESTIVE TRACT

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Many common digestive dysfunctions that plague us today have their roots in a nerve that is gaining attention within the world of scientific research, yet the average person doesn't know it exists. It is called the vagus nerve, and it plays a role in everything from heart health to digestive system support to inflammation to emotional behavior.

Vagus is the Latin word for “wandering”, an appropriate description for a nerve that extends throughout most of the visceral system. It is the 10th cranial nerve and the largest parasympathetic nerve of the autonomic nervous system. The *vagus* nerve begins in the medulla oblongata of the brain stem and then extends through the cervical, thoracic and abdominal regions of the body, innervating most organs from the neck to the transverse colon, with exception of the adrenal glands. (1)

The *Vagus* nerve has both motor and sensory functions. Sensory neurons make up a 70-80% majority of the CN10 nerve fibers, sending sensory information from our tissues to the central nervous system. Some of its sensory functions include: A) **general sensory**: innervation of the skin behind the ear, part of the external ear canal, dura and posterior cranial fossa; B) **visceral sensory**: information from the larynx, esophagus, lungs, trachea, heart and most of the digestive tract; C) **special sensory**: a small role in the sense of taste near the root of the tongue. The *vagus* nerve also regulates **visceral motor** function through parasympathetic fibers from smooth muscles including: a) muscles of the pharynx (swallowing), larynx (speech), and the soft palate (the fleshy area near the root of the tongue which initiates the gag reflex); b) muscles of the heart-helping to lower the resting heart rate; c) stimulating involuntary contractions in the digestive tract including the esophagus, stomach and most of the intestines – allowing food to move through the tract. (2)

It is now known that the *vagus nerve* – CN10, has a considerable number of functions far beyond what was initially thought. The following will

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focus on how the vagus nerve impacts our digestive system, and how massage therapists can utilize this nerve in their practice.

VAGUS NERVE AND THE ENTERIC NERVOUS SYSTEM

Understanding the function of digestion requires knowledge of another nervous system, *the enteric nervous system (ENS)*. This nervous system consists of two nerve plexi embedded in the wall of the entire gastrointestinal tract (esophagus to anus). The *submucosal plexus* regulates gastrointestinal blood flow and controls epithelial cells lining the lumen and its microbiota (trillions of microorganisms within gastrointestinal tract). Second, the *myenteric plexus* regulates relaxation and contractions of the intestinal wall muscles. (3)

The ENS is described as “the second brain” due to its similarity to the brain in reference to its structure, function and chemical coding. (4) ENS neurons are also in close contact with cells of the innate and adaptive immune system, regulating responses to foreign antigens and inflammation.

BRAIN-GUT-AXIS AND HYPOTHALAMUS-PITUITARY-ADRENAL (HPA)

How does information from the gut make its way back to the brain: the VAGUS NERVE!!! Let's follow the signal: the ENS nerve endings within the lumen of the digestive tract report on the homeostasis of its system via the cholinergic neurochemical transmitter, activating nerve endings of the *vagus* (AFFERENT) sensory nerve. Signals travel fast, with many possible interconnections along the way. Connections are made among the ENS (enteric), ANS (sympathetic/parasympathetic *vagus* nerve), other organs (adrenals), spinal cord, brain stem and higher brain centers (hypothalamus, pituitary). Communication between

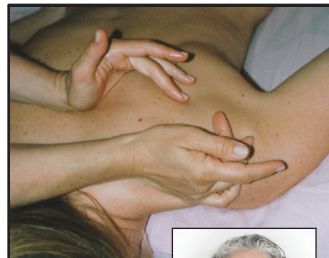
the *vagus* nerve and the Hypothalamus-Pituitary-Adrenal tract impacts regulation of the body's digestive, immunological and hormonal functions.

Environmental stress influences the gut's microbiota - the trillion microorganisms within the gastrointestinal tract. The microbiota is a potential key modulator for both immune and nervous systems. Constantly confronted with food antigens and possible pathogens that present risk factors for inflammation, the first line of defense goes into action. Appearance of the pathogenic organisms activate innate immune cells within the mucosal lining of the gut to produce neurochemicals (cytokine) that mediate local and systemic inflammation. The *vagus* nerve responds to these increased neurochemicals, along with the mechanical distension of the muscular wall of the stomach and neuronal signals. Once the brain receives the information, responses sent along the vagal efferent fibers synapse onto the enteric nerve receptors providing immediate modulation (reduction of cytokine and increase of macrophages) to the affected area of inflammation. Research is now providing evidence that nutritional components (probiotic and gluten),

as well as drugs and antibiotics have a significant impact on vagal nerve activity.

WOW!!! GOOD INFORMATION TO KNOW...NOW WHAT??

It is clear that our digestive health is dependent upon healthy vagal tone. How can we as massage and manual therapist contribute to our own vagal tone and help our clients to do so as well? Visceral manipulation of the organs of the digestive system stimulates the fascia environment surrounding the organs, stimulating nerve receptors within the fascia, including the *vagus* nerve receptors. Gentle yet specific techniques mobilizing the muscular wall of the digestive tract also stimulate the nerve receptors within these muscles. Energetic techniques can influence a nerve plexus, contributing to the homeostasis of the autonomic nervous system. The diaphragm, which is innervated by the *vagus* nerve, can be utilized through simple deep/slow breathing techniques, influencing vagal tone. And there is so much more!! Hopefully I have stimulated your curiosity about this marvelous CN 10, the *vagus* nerve!!



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